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| 7590 | 08/30/2005 | | EXAMINER | |
| Michael G. Fletcher Fletcher Yoder P.O. Box 692289 Houston, TX 77269-2289 | | | BLUM, DAVID S | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2813 | |

DATE MAILED: 08/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary

Application No.

10/771,085

Applicant(s)

COBBLEY ET AL.

Examiner

David S. Blum

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 8-20 is/are rejected.
- 7) ☒ Claim(s) 2-7 is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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This action is in response to the response filed 6/20/05.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 9-11, 15, 18, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Blackshear (US006774475B2).

Blackshear teaches all of the positive steps of claims 1, 9-11, 15, 18, and 20 in that a stack of at least two semiconductor die are formed (column 4 lines 8-9), and the stack is tested prior to mounting on a packaging substrate (claim 14).

Regarding claim 9, Blackshear tests for defective chips (column 4 lines 10-11), thus functionally testing.

Regarding claim 10, Blackshear tests for data pins (column 4 lines 37-39), thus environmentally testing.

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Regarding claim 11, as the stack is tested prior to mounting on a packaging substrate (column 3 lines 51-54, claim 14) it must be attached to a package substrate, electrically connecting the stack is coupling.

Regarding claim 15, the packaging substrate comprises a wafer (120, substrate is a wafer).

Regarding claim 18, the tested stack package forms an integrated circuit (IC) package (column 1 line 49).

Regarding claim 20, the stacked die comprises a memory die (column 1 lines 22-23).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blackshear (US006774475B2) in view of Huang (US 6753206).

Blackshear teaches all of the positive steps of claim 17 as recited above, except for the stack comprising a shingle stack. Huang teaches a conventional stack (conventional art)

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and a shingle stack (figures 2 and 5) with the advantage of being able to package chips of various sizes (column 2 lines 45-47). Further, it is noted that the instant application teaches both conventional stacking and shingle stacking (page 4 of the instant specification) as alternatives with no criticality taught between the two alternate stacking structures.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in the claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1515, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would be obvious to one skilled in the requisite art at the time of the invention to modify Blackshear by utilizing a shingle stack structure as taught by Huang to have the advantage of being able to package chips of various sizes (column 2 lines 45-47).

5. Claims 8, 12-13, 16, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang (US 6,343,019) in view of Blackshear (US006774475B2) and Pai (US 6503776).

Jiang teaches all of the positive steps of claims 8, 12-13, 16-17, and 19 as recited above, except for testing the stack prior to mounting on a packaging substrate and that a stack may be three or more chips.

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Blackshear teaches a stack of at least two semiconductor die are formed (column 4 lines 8-9), and the stack is tested prior to mounting on a packaging substrate (claim 14). The pre-testing is done to reduce rework or discard of packages (column 4 lines 10-15).

Regarding claim 8 Jiang teaches stacking two semiconductor die, but also “the present invention can be applied to other geometry die and die arrangements”. This is suggestive of three or more die in the stack. Pai teaches a die stack comprising three (110, 160, and 130) die. Pai teaches multi-chip modules help minimize the system operational speed restrictions imposed by long printed circuits (column 1 lines 16-18).

Regarding claim 12, the stack may be formed (or secured to the substrate) by the use of adhesive tape (Jiang, column 3 line 62), thus a tape reel.

Regarding claim 13, the adhesive of Pai may be a film adhesive, thus the stack is placed upon a film frame (column 4 lines 2).

Regarding claim 16, Pai teaches when using adhesive in a multi-stack, the second adhesive should have a lower curing temperature (exothermic temperature) than that of the first adhesive (column 3 lines 29-37).

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Regarding claim 19, Pai teaches that it is known to use stacked chips in connection with processors (thus forming an electronic system) to minimize the system operational speed restrictions imposed by long printed circuits (column 1 lines 16-19).

It would be obvious to one skilled in the requisite art at the time of the invention to modify Jiang by pre-testing the stack prior to package mounting to reduce rework or discard of packages (column 4 lines 10-15) and to use at least three chips in a stack as taught by Pai to help minimize the system operational speed restrictions imposed by long printed circuits (column 1 lines 16-18).

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang (US 6,343,019) in view of Blackshear (US006774475B2) and Moden (US 5719440) or Hakey (US006627477B1).

Jiang and Blackshear teach all of the positive steps of claim 14 as recited above except for using a gel. Jiang teaches an adhesive or adhesive tape. Moden teaches bonding "to an upper surface of a master board with an adhesive, which may comprise a liquid or gel adhesive, or an adhesive tape, all as known in the art." (column 4 lines 46-49) Thus the three have art recognized equivalence. Hakey uses a polyimide with a solvent (a gel) to bond chips (column 3 lines 22-35).

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It would be obvious to one skilled in the requisite art at the time of the invention to modify Jiang and Blackshear by using a gel as taught by Hakey and by Modem to be known in the art, and to be an art recognized equivalence.

Allowable Subject Matter

7. Claims 2-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 2 contains the limitation of stacking semiconductor die where a first die is picked and held by the apparatus, an adhesive is applied to a surface and while being held by the apparatus, and a second die is placed on the adhesive layer to form the die stack. This limitation, in combination with the other limitations of claim 2 is not taught or suggested by the prior art of record. Pai (US006503776B2 and US006387728B1) forms the stack by first bonding a die to a substrate and then bonding a die to the first die. Thus, the first die is not held by a pick-apparatus when the second die is bonded (stacked). Rajagopalan (US006586825B1) also stacks the die in place on the substrate.

Claims 3-7 are dependent upon objected claim 2.

Response to Arguments

8. Applicant's arguments filed 6/20/05 have been fully considered but they are not persuasive.

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The applicant cites case law regarding Section 102 that a single reference must show every element of the claimed invention, and that a cited reference must be enabled to declare an invention "not novel"

The applicant argues that Blackshear is directed to individual memory chips that are pre-tested prior to mounting on substrates and Blackshear clearly teaches individual chips and not a stack of at least two semiconductor die. The examiner disagrees.

Blackshear teaches a method of pre-testing (multiple) chip packages on a substrate.

The chip package may be a single memory chip, or one or many chips (column 3 lines 51-54). Therefore each chip package may contain more than one pre-tested semiconductor chip (a stack) prior to mounting (several packages) on the substrate.

Regarding the reference to claim 13 of Blackshear, attention is drawn to column 3 lines 51-54, teaching that a single chip package may contain one or many chips.

The applicant argues that although Blackshear may teach multiple chips, Blackshear does not teach a stack. However, Blackshear teaches a chip the length of the package, thus multiple chips would be stacked. Further, in the background of the invention, Blackshear teaches that stacking is a common method of making packages of multiple chips. Blackshear teaches a method to minimize the size of stacks, but not to eliminate them. Thus one of ordinary skill in the art would recognize Blackshear's multiple chips in a package (tested and placed upon a substrate with multiple packages) to be stacks.

The applicant argues that Blackshear does not enable forming a stack because it is not illustrated. Blackshear teaches multiple chip packages attached to a substrate. Each chip package (as illustrated) has a chip the length of the package. As the chip represents "many chips" and chip stacks are discussed in the background, Blackshear does disclose a stack, and Blackshear is enabled.

The applicant argues that Blackshear does not teach "testing the semiconductor die in the stack prior to attaching ..." because Blackshear does not teach a stack as argued above. As above, the examiner believes that each package to be tested prior to be mounted on a substrate includes multiple chips and thus a stack as suggested by the background.

The applicant then argues that Blackshear teaches pre-testing a memory chip package and not the chip; thus, Blackshear is not testing "the semiconductor die in the stack prior to attaching the semiconductor die to a packaging substrate". However, the claim is not specific as to "a packaging substrate". Blackshear places a chip or stack of chips on a packaging substrate and after testing, places the chip or stack on a second packaging substrate. Therefore, the stack is tested prior to placing on a packaging substrate. The applicant further argues that Blackshear teaches "the direct burn in of single chips is impractical for several reasons", thus confirming that Blackshear does not disclose

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"after the stack is formed" however, Blackshear teaches testing the package (a package may be multiple chips) prior to mounting on a package substrate.

The applicant argues that dependent claims are allowable because the underlying claim is allowable. However, the examiner is not persuaded that the independent claim is allowable.

The applicant also argues that Huang does not teach a shingle stack (the applicant states this a stack where upper die may overhang die below them such that their centers are not aligned. However, Huang teaches a stack where one chip overhangs another such that their centers are not aligned. As best understood, this is a shingle stack

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David S. Blum

August 29, 2005